Message from the Administrator

I am pleased to present the U.S. Environmental Protection Agency's *Draft Report on the Environment*, a key step toward building a set of environmental indicators that will help answer the important questions Americans have about the environment, and that will guide our environmental decision-making in the future. This draft report provides a frank discussion of what we know—and what we don't know—about the condition of our nation's environment.

As we look over the past three decades, we see a real record of success in cleaning up and protecting our nation's environment. By many measures, our environment is healthier today than it was in 1970. The nation's commitment to environmental protection has produced cleaner air, safer drinking water for more Americans, and a much improved approach to managing wastes. Where we once took our environment for granted, we now intuitively understand the importance of environmental quality for our future. Much work remains to be done, however, and we must continue to build on our record of progress.

With this draft report, we begin an important national dialogue on how we can improve our ability to assess the nation's environmental quality and human health, and how we use that knowledge to better manage for measurable environmental results. I invite you to participate in this dialogue with us and our partners. Your comments and feedback are essential to our future efforts.

The President has called for a government focused on priorities and dedicated to excellence in public service. His Management Agenda is designed to improve the ability of the federal government to manage for results.

I thank the many EPA staff members from every program and region, our federal, tribal, state and local government partners, and the independent scientists and research institutions that contributed to this draft report.

We are all stewards of this shared planet, responsible for protecting and preserving a precious heritage for our children and grandchildren. As long as we work together and stay firmly focused on our goals, I am confident we will make our air cleaner, our water purer, and our land better protected for future generations.

Christine Todd Whitman

Administrator

Contents

Executive Summary

In this *Report on the Environment*, the U.S. Environmental Protection Agency (EPA) presents its first-ever national picture of the U.S. environment. The report describes what EPA knows—and doesn't know—about the current state of the environment at the national level, and how the environment is changing. The report highlights the progress our nation has made in protecting its air, water, and land resources, and describes the measures that can be used to track the status of the environment and human health. Key conclusions from this report are summarized below.

This report is the first step in EPA's Environmental Indicators Initiative. Launched in November 2001, this initiative seeks to develop better indicators that EPA can use to measure and track the state of the environment and support improved environmental decision-making. As a first step in developing this report, EPA identified a series of key questions about the environment—questions such as: What is the condition of waters and watersheds in the United States? What is the quality of outdoor air in the United States? The Agency then carefully examined data sources, including those from other federal agencies, to identify indicators (e.g., the extent of wetlands and the concentrations of criteria pollutants in air) that could answer these questions on a national level.

These indicators provide the basis for this report. They also reveal that there is much we don't know about the status of our environment because we currently lack sufficient information to provide a more complete picture. An important next step in EPA's initiative will be working closely with other federal agencies, tribes, states, local governments, non-governmental organizations, and the private sector to create a long-term strategy for developing an integrated system of local, regional, and national indicators. This work will involve a number of challenges, including developing better data to support better indicators, making indicators more understandable and usable, and more fully elucidating the linkage between the causes and effects of environmental pollution and stressors.

EPA is issuing this report as a draft to stimulate dialogue and invite input into developing and improving environmental indicators in the future. EPA welcomes your suggestions about how well this report communicates environmental status and trends and how to better measure and manage for environmental results. To learn more about the Environmental Indicators Initiative, to access the Technical Document that provides the detailed scientific foundation for this report, or to provide comment and feedback on this report, please visit **http://www.epa.gov/indicators/**.

Cleaner Air

The nation's air is much cleaner today than it was 30 years ago. Remarkably, this progress has occurred even while, during the same 30-year period, the U.S. Gross Domestic Product increased 161 percent, energy consumption increased 42 percent, and vehicle miles traveled increased 149 percent. Notwithstanding this progress, challenges remain in attaining health based-standards for ozone and particulate matter, in improving visibility, and in understanding the nature and magnitude of issues posed by indoor air pollution.

Outdoor Air

Emissions of the six principal air pollutants have decreased. Over the last 30 years, total emissions of six principal air pollutants have decreased by nearly 25 percent, resulting in lower concentrations of these pollutants in ambient air. Many people live in areas of the country that do not always meet the health-based standards for certain pollutants. More than 133 million people live in areas where monitored air quality in 2001 was unhealthy at times because of high levels of at least one criteria air pollutant. At the same time, the percentage of days across the country that air quality violated a health standard dropped from almost 10 percent in 1998 to 3 percent in 2001.

Air toxics emissions have declined. The National Toxics Inventory, which tracks 188 toxic pollutants, estimates that nationwide air toxics emissions decreased almost 24 percent from baseline levels (1990–1993) to 4.7 million tons annually in 1996. Although data and tools for assessing the impacts of air toxics are limited, available evidence suggests that emissions of air toxics may still pose health and ecological risks in certain areas of the U.S.

One of the major components of acid rain, wet sulfate deposition, has declined. Wet sulfate deposition levels for 1999–2001 showed reductions of 20 to 30 percent compared to levels for 1989–1991 over widespread areas in the Midwest and the eastern U.S., where acid rain has had its greatest impact. Wet nitrogen deposition decreased slightly in some areas of the eastern U.S. but increased in others, including those with significant agricultural activity.

Indoor Air

Indoor air quality remains a concern. Because the American public spends most of its time indoors, indoor air quality is a serious issue. While more information is needed about pollutant exposures and their effects in indoor environments, national studies have shown that levels of some pollutants indoors can be much higher than outdoor levels. Two indoor air pollutants of particular concern are radon and environmental tobacco smoke (ETS), the latter especially for children. We are achieving, however, decreases in exposure to ETS. In 1998, young children were exposed to ETS in approximately 20 percent of homes in the U.S.—down from approximately 39 percent in 1986.

Global Issues

The stratospheric ozone layer has become thinner in recent decades, principally over the Antarctic. While acknowledging high uncertainties in the data, scientists calculate that since the 1980s, ultraviolet radiation levels at 10 stations in both the northern and southern hemispheres have increased by 6 to 14 percent. However, it is believed that because of the phase-out of ozone-depleting substances, the stratospheric ozone layer will recover, and ultraviolet radiation levels from human-induced stratospheric ozone depletion are close to the maximum they will reach.

Purer Water

Pristine waterways, safe drinking water, lakes for swimming and fishing, and aquatic life habitat are treasured resources. The nation has made significant progress in protecting these resources in the last 30 years. For example, concerted action to protect the nation's waters has reduced discharges of pollutants to surface water and improved safety of drinking water supplies. Challenges remain, however, including polluted runoff, landscape modification, changes to water flow, airborne pollutants settling into surface water, and the aging of both wastewater and drinking water infrastructures. The precise scope and scale of these challenges—at the local and the national scale—are uncertain.

Waters and Watersheds

We know a great deal about the condition of the nation's waters at the regional, state, tribal, and local levels, but we do not have enough information to provide a comprehensive picture at the national level. The way in which the nation collects water quality data does not support a comprehensive picture of watershed health at the national level.

The nation's estuaries are in fair to poor condition, varying from poor conditions in the northeast, Gulf, and Great Lakes regions to fair conditions in the West and Southeast, based on measurements of seven coastal condition indicators.

Rates of annual wetland losses have decreased from almost 500,000 acres a year three decades ago to a loss of less than 100,000 acres averaged annually since 1986. Nevertheless, in key parts of the U.S., we continue to lose valuable wetlands.

Drinking Water

An increasing number of people are served by community water systems that meet all health-based drinking water standards. In 2002, states reported that 94 percent of the population served by community water systems were served by systems that met all health-based standards, up from 79 percent in 1993. Underreporting and late reporting of data affect the accuracy of this information.

Recreation in and on the Water

The number of beach closings has increased, but this likely reflects more consistent monitoring, reporting, and use of state-wide advisories over time, rather than a decline in the condition of recreational waters. From 1997 to 2001, the percentage of beaches affected by advisories or closings rose from 23 to 27 percent. During that same period, the number of agencies reporting to EPA on beach advisories and closings rose from 159 to 237.

Consumption of Fish and Shellfish

The percentage of U.S. fresh waters under fish consumption advisories has increased in recent years. Similar to beach closings, these increases may be the result of more consistent monitoring and reporting, so they do not necessarily indicate that conditions are getting worse. An estimated 14 percent of river miles, 28 percent of lake acreage, and 100 percent of the Great Lakes and their connecting waters were under fish consumption advisories for at least some portion of 2001. Following the U.S. ban in the mid-1970s, PCB concentrations significantly declined in Lake Michigan fish and concentrations of PCBs in lake trout declined consistently through the year 2000 in Lakes Ontario, Huron, and Michigan.

Better Protected Land

The U.S. is a nation rich in land resources. Much like air and water, land is a resource that must be carefully protected. Protecting land resources means ensuring that lands meet current societal needs and support healthy communities and ecosystems. To this end, EPA's land protection activities focus on prevention, management, control, and cleanup of various substances that are released to or used on land. Many other governmental and private agencies at the federal, state, and local levels manage land for natural resource and conservation purposes.

Land Use

The U.S. contains approximately 2.3 billion acres of land. That total area includes 1,055 million acres of grasslands and shrublands, 749 million acres of forests, 410 million acres of agricultural lands, and 98 million acres of developed land.

The majority of land within the U.S. is privately owned. Almost 1.5 billion acres of private and tribal land are managed solely by their owners, with zoning and other land use regulations as the only constraints. The federal government manages nearly 28 percent of the nation's land.

While land conservation efforts continue, the amount and rate of land development has increased. More than 4 percent of the nation is designated as wilderness, and millions of other acres are protected in parks, refuges, or other classifications of reserved land. In 1997, 4.3 percent of U.S. total land area—98 million acres—was developed, up from 3.2 percent in 1982. The pace of land development in the 1990s was 1.5 times that in the 1980s.

Chemicals in the Landscape

Industrial releases of toxic chemicals as reported to the Toxics Release Inventory have declined in recent years. EPA's Toxics Release Inventory (TRI) tracks releases of more than 650 chemicals. The original set of chemicals (332 of the 650 TRI chemicals) from industries that have reported consistently since 1988 shows that total on- and off-site releases decreased 48 percent between 1988 and 2000, a reduction of 1.55 billion pounds. In addition, between 1998 and 2000, toxic releases of all 650 TRI chemicals decreased by approximately 409 million pounds.

Testing of foods for pesticide residues in 2000 found that no more than 1.4 percent of samples exceeded regulatory limits. Each year, the U.S. Department of Agriculture works with states to collect and analyze samples of a variety of foods for pesticide residues using methods that can detect concentrations orders of magnitude lower than levels that might cause health concerns.

Waste and Contaminated Lands

Over the last 40 years, the total amount of municipal solid waste generated in the U.S. has increased, though per capita generation has remained relatively constant over the last decade. While the nation is generating more waste, its waste management practices have improved, particularly through increased recycling. The amount of municipal solid waste recovered (recycled or composted) increased more than 1,100 percent in the last decade.

The nation is making progress in dealing with hazardous waste. In 1999, EPA estimated that the 20,000 businesses within the U.S. classified as "large quantity generators" (defined as those that generate more than 2,200 pounds of hazardous waste each month) collectively generated 40 million tons of Resource Conservation and Recovery Act (RCRA) hazardous waste. Between 1991 and 1998, for 17 of the most toxic chemicals in hazardous waste, the total amount fell by 44 percent. Between 1998 and 2000, 12 billion pounds—approximately one third—of all toxic chemicals used in industrial processes were recycled. Today, virtually all hazardous waste is either recycled, or processed by treatment that destroys the toxic pollutants or reduces the ability of the pollutants to enter the environment. Once treated, this waste is disposed of in landfills designed to prevent any releases. This represents a vast improvement over the disposal practices used 25 years ago.

The nation is making progress in cleaning up contaminated lands. As of October 2002, there were 1,498 sites on the Superfund National Priorities List (NPL)—a list of the most toxic waste sites in the nation. Of these, 846 sites are construction completion sites (i.e., sites where physical construction of all cleanup actions are complete, immediate threats are addressed, and all long-term threats are under control). This is up from 149 construction completes in 1992. In addition, approximately 3,700 hazardous waste management sites are subject to RCRA corrective action which would provide for investigation and cleanup and remediation of releases of hazardous waste and constituents. Of these, 1,714 high-priority sites are targeted for immediate action by federal, state, and local agencies.

Human Health

Protecting the health of the American public from environmental pollutants is a key part of EPA's mission. People need clean air, water, and land to live, breathe, eat, and drink. Over the past 100 years, our understanding of the potential threats to our health from environmental pollution has grown, but there is still much to learn about environmental condition and human health.

The health of the American public is generally good and improving. People are living longer than ever before—in the last century, life expectancy at birth increased from 51 to 79.4 years for women and from 48 to 73.9 years for men. Infant mortality has dropped to the lowest level ever recorded in the United States. Infant mortality is still higher in this country than in other developed nations, however, and life expectancy is somewhat lower. The death rate for the nation's main health threats—heart disease, cancer, and stroke—is decreasing, although the number of people developing some diseases, such as childhood asthma, is increasing.

Many studies in people have demonstrated an association between environmental exposure and certain diseases or health problems. Examples include radon and lung cancer; arsenic and cancer in several organs; lead and nervous system disorders; disease-causing bacteria such as *E. coli* O157: H7 (e.g., in contaminated meat and water) and gastrointestinal illness and death; and particulate matter and aggravation of heart and respiratory diseases.

There are still unanswered questions about the links between some environmental pollution and health problems. Factors such as the amount and frequency of exposure and a person's age, health, genetic make-up, and lifestyle affect whether a person will show symptoms of exposure or develop disease. Better disease data that could be linked directly with environmental monitoring data would support efforts to determine stronger connections between disease and environmental exposure.

Some segments of the population, especially children and the elderly, may be more susceptible to adverse health effects from some environmental pollutants. People with existing health problems and with compromised immune systems may also be at higher risk. Understanding the potential impacts of pollutants on such sensitive groups is important in shaping national health standards and policies.

Biomonitoring has helped document the reduction in blood lead levels of young children in the past 25 years due largely to the ban of leaded gasoline, as well as the reduction of cotinine, a measure of the exposure to environmental tobacco smoke, in children, partly due to declining numbers of adult smokers. Using biomonitoring to measure pollutant residues in the body is one way to identify the levels of pollutants that may cause health problems and can help gauge the success of actions to limit exposure. Biomonitoring involves taking samples (usually in blood or urine) from people to measure individual exposure.

Ecological Condition

The nation's air, water, land, and living things interact in diverse and complex ways to shape the nation's ecological condition. Currently, we lack the means of capturing all of the appropriate measures for the physical, chemical, and biological factors that influence ecological condition on a national basis. Recognizing that ecological condition is best described by considering the integration of all of the environment's parts and processes, we are beginning to get a sense for how the conditions of our air, water, and land impact the health of our ecosystems.

EPA is moving in the direction of using ecological condition to measure for results. For example, efforts to reduce acid rain have had significant results: One-quarter to one-third of lakes and streams in three regions previously affected by acid rain are no longer acidic. Measuring for ecological results will require data about both ecological stressors (e.g., air and water pollutants) and ecological condition. It will also require an understanding of the relationship between the two.

The EPA Science Advisory Board's framework for assessing ecological condition provides a key organizational tool for assessing ecological condition. This tool contains six essential ecological attributes that characterize the health and diversity of every ecosystem type. In this report, EPA has examined various indicators that address these six attributes.

Assessments of condition that use many variables can be summarized to make them more understandable and usable. The index of biotic integrity (IBI), for example, is a useful approach that combines multiple variables that reflect the ecological condition of a place, such as biological diversity and the health of individual organisms. For example, a Fish IBI, used to assess the condition of mid-Atlantic streams, showed that 53 percent of these streams were in good or fair condition and 31 percent were in poor condition (evaluation of the remaining 16 percent was inconclusive).

Currently, there are significant gaps in our ability to describe ecological condition at the national level. Ultimately, we want to have indicators that provide a national picture and that can be used across the various ecosystem types. Rare and at-risk species and population trends in bird communities are promising indicators that may be used across different ecosystems.

Introduction

How clean are our nation's air, water, and land? How healthy are its people and ecosystems? How can we measure the success of policies and programs to protect health and the environment?

This report provides the U.S. Environmental Protection Agency's (EPA's) response to these questions, with the aim of sparking a broader dialogue and discussion about how to answer them in the future. The report has two key purposes:

- To describe what EPA knows—and doesn't know—about the current state of the environment at the national level, and how the environment is changing.
- To identify measures that can be used to track the status of and trends in the environment and human health, and to define the challenges to improving those measures.

This report is the first step in EPA's Environmental Indicators Initiative. Launched in November 2001, this initiative seeks to develop an improved set of environmental indicators that will enable EPA to better manage for results and better communicate the status of the environment and human health. These indicators will provide critical tools for EPA to define environmental management goals and measure progress toward those goals. Early drafts of this report have already been helpful in developing EPA's strategic plan for 2003 to 2008.

An important next step in EPA's initiative will include working closely with partners—other federal agencies, states, tribes, local government, non-governmental organizations, and the private sector—to create a long-term strategy for developing an integrated system of local, regional, and national indicators. This report is issued as a draft to stimulate dialogue and invite input into developing and improving environmental measures in the future. EPA welcomes your suggestions about how well this report communicates environmental status and trends and how to better measure and manage for results. To learn more about the initiative and to provide your comments and feedback, please visit **http://www.epa.gov/indicators/**.

Using Indicators to Measure Results

This report uses the lens of environmental and health indicators to bring the current state of the U.S. environment into focus. Environmental indicators are measures that track environmental conditions over time. For example, they help measure the state of air, water, and land; the pressures on those resources; the status of human health; and the integrity of our nation's ecosystems. Examples of environmental indicators include concentrations of criteria air pollutants in ambient air, the extent of wetlands, and the levels of lead in the blood of Americans.

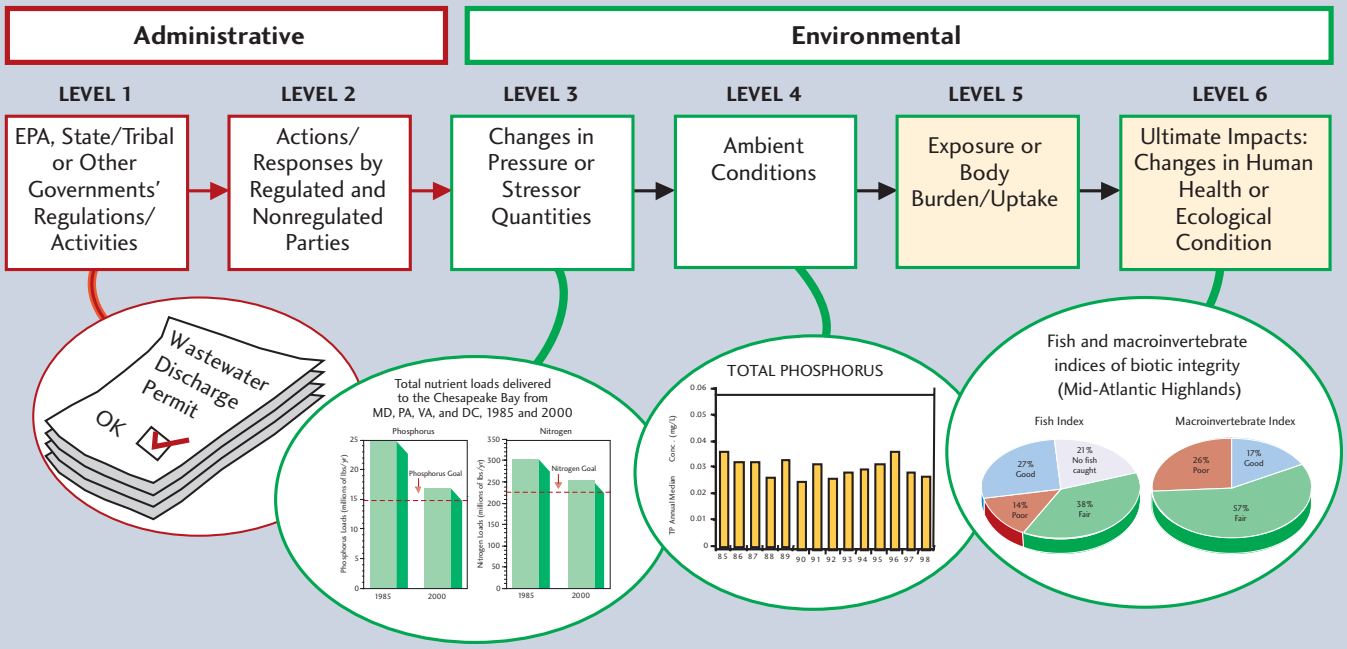
Environmental and human health indicators focus on outcomes—actual environmental results, such as cleaner air and

Working with Partners

Protecting the environment and human health is not EPA's task alone. Many federal departments implement legislation and manage programs that contribute directly to those goals. State, local, and county governments, along with federally recognized tribes, administer environmental programs as well. Many other factors influence human and environmental health: individual choices, collective actions by citizens, and decisions made by industry all contribute to the health of society as a whole, and of its surrounding environment.

In developing this draft report, EPA learned much from the experiences of others: the White House Council on Environmental Quality, other federal departments and agencies, tribes, and states; The H. John Heinz III Center for Science, Economics and the Environment; NatureServe; the EPA Science Advisory Board; and the National Research Council. This draft report is much stronger as a result of the comments, advice, and data they made available to EPA.

Exhibit i-1: Hierarchy of Indicators



Source: Revised from EPA, Chesapeake Bay Program. *Chesapeake Bay Hierarchy of Indicators*. 2000.

water or improved human health or ecosystem condition—rather than on administrative actions, such as the number of permits issued. At one time, administrative measures of performance were considered sufficient indicators of progress. While administrative measures track what actions have been taken, they don't tell us whether those actions actually improved the environment or human health. Understanding the effectiveness of environmental programs, and measuring actual progress, requires indicators of health and environmental conditions.

Exhibit i-1 depicts this "hierarchy" of measures. Levels 1 and 2 are indicators of "response"—government administrative actions, such as the issuing of discharge permits, and responses to those actions. Level 3 indicators measure pressures on the environment, such as changes in the quantities of discharges to water. Levels 4, 5, and 6 all measure the state of the resource—such as changes in ambient levels of a pollutant or changes in the health of an ecosystem. To link environmental protection with real-world results, indicators and performance measures at each level of the hierarchy are required.

This report focuses, where possible, on indicators that describe environmental status and trends at a national level. In many cases, however, national-level indicators do not yet exist or are not supported by adequate data. In some of these cases, local and regional indicators do exist and are featured as examples in this report; these indicators are valuable for a number of reasons. They serve as examples of what national indicators might look like in the future. They provide important perspective on conditions at the local and regional levels, they are critical to understanding cause-and-effect relationships in the environment, and they provide an important tool for local decision-making.

Invitation to a Dialogue

EPA invites your participation in the discussion about this draft report. We welcome your suggestions about this draft report, the future directions for EPA's Environmental Indicators Initiative, how best to measure and manage for results, and how to effectively communicate about environmental status and trends to the public. To learn more about the initiative and to provide your comments and feedback, please visit **http://www.epa.gov/indicators/**.

Introduction

About This Report

This report is organized around five core chapters (see chart below). The first three describe the current state of the primary components of the physical environment—air, water, and land—and the principal stressors that can affect their conditions. The final two chapters present indicators on human health and ecological condition.

The report was driven by a series of questions, developed by EPA, that address three themes: what is happening, why is it happening, and what are the effects. For example, in the area of outdoor air, the questions address the quality of the nation's air (*what is happening*), the factors contributing to outdoor air pollution (*why*), and the human health and ecological effects of outdoor air pollution (*what are the effects*).

Once the questions were developed, EPA examined data sources to identify potential indicators to address these questions on a national level. Scientists from inside and outside EPA then screened these indicators for their scientific soundness and relevance to the questions. Only indicators judged to be scientifically sound were included in this report. The questions posed in each chapter, and the indicators selected to answer them, are listed in Appendix A. Chapter 6 describes some of the challenges in developing and using indicators at the national level. The scientific foundation and more detailed information for the indicators listed in this report are presented in the accompanying Report on the Environment Technical Document (available online at **http://www.epa.gov/indicators/**).

This report provides significant information about the nation's environment; however, its scope is limited in several ways. First, the report focuses primarily on the U.S.; it does not address international environmental conditions or issues that may affect environmental quality in this country. Second, the report provides information on status and condition, but does not describe the many important initiatives that EPA and its partners are undertaking to protect the environment and human health. More information about specific program initiatives and other indicator-related background materials, as well as links to EPA partners, can be found online at **http://www.epa.gov/indicators/**.

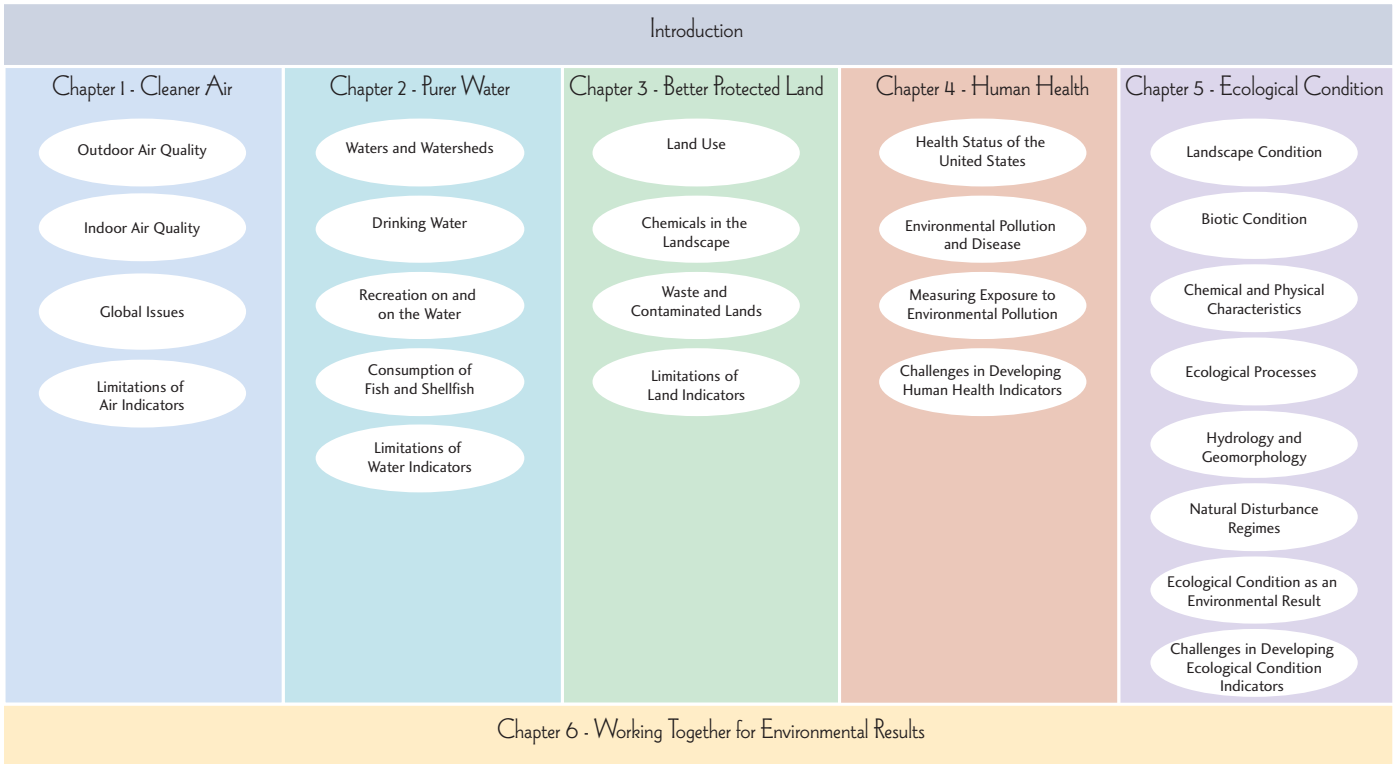
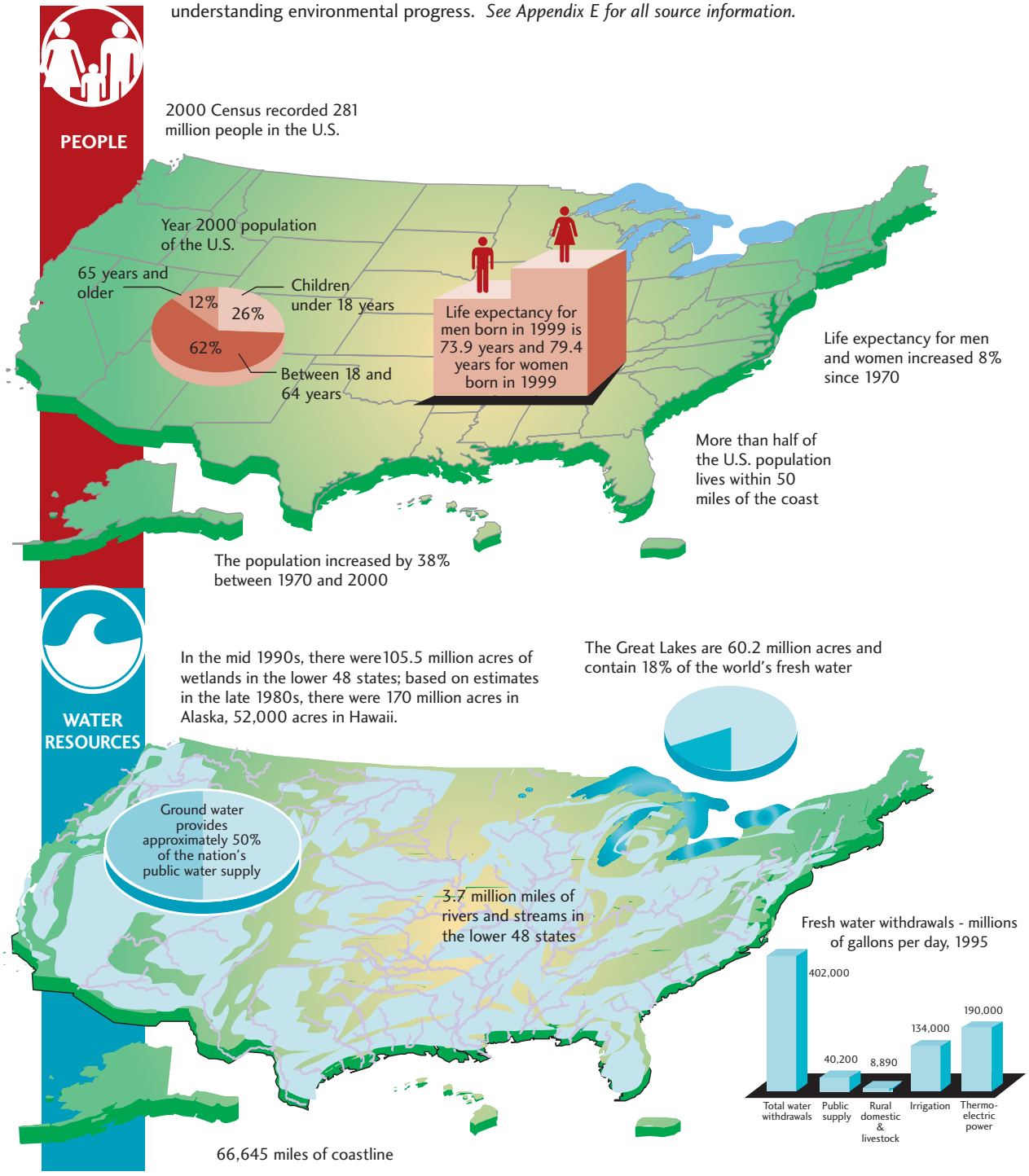


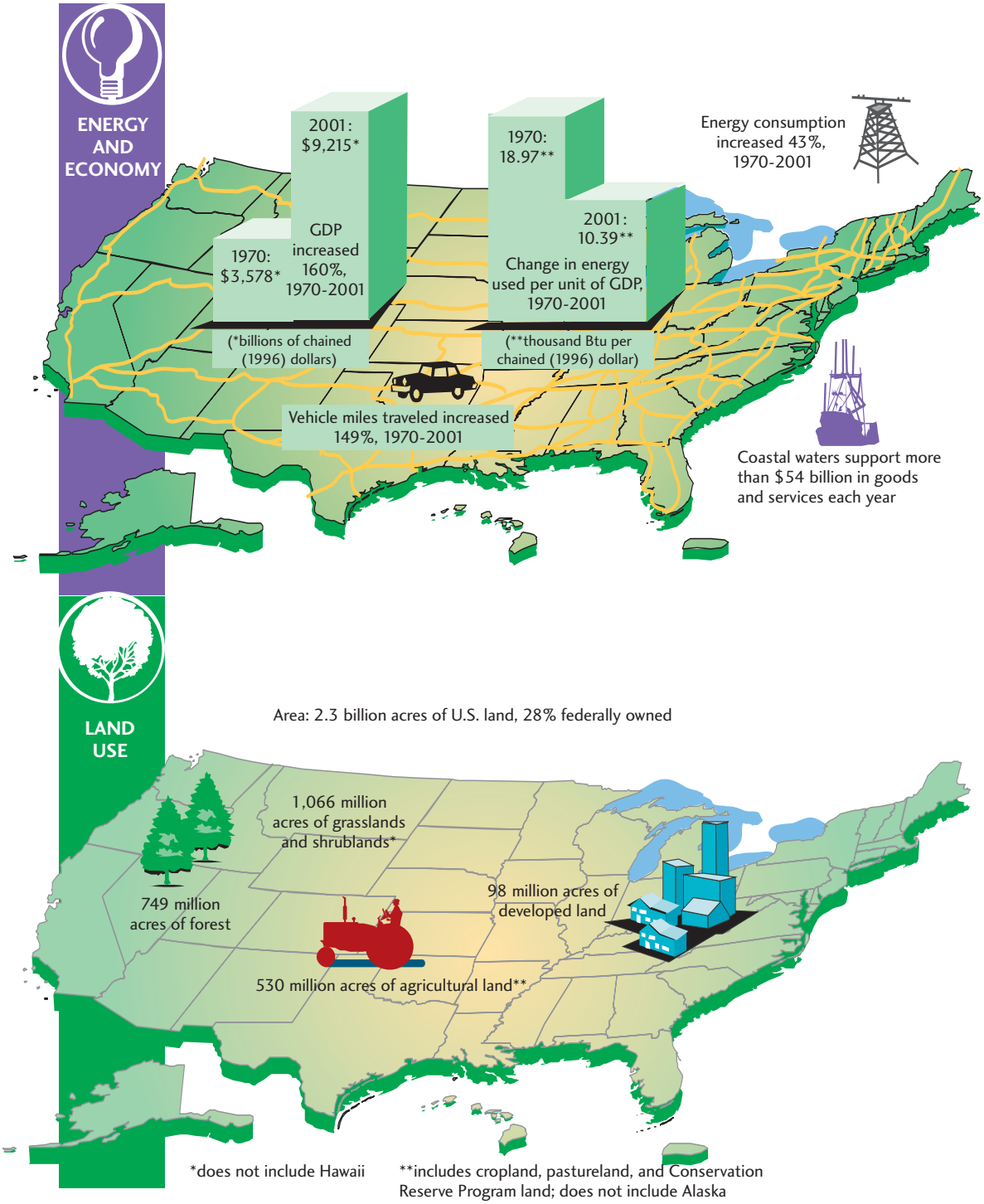
Exhibit i-2 Environmental Protection in Context

EPA recognizes the importance of quality of life and sustainability in any effort to measure outcomes. The nation's environmental protection laws aim to improve Americans' quality of life by simultaneously protecting health and environmental resources and promoting economic prosperity. This exhibit provides some statistical context for understanding environmental progress. *See Appendix E for all source information.*



Introduction

Exhibit i-2 Environmental Protection in Context



More than 4% of the nation is designated as wilderness and millions of other acres are protected in national parks, state parks, wildlife refuges, or other classifications of conserved land.

Introduction